An Assessment of Risks due to Asbestos Containing Materials on Tracks

Measurement of Concentrations, extrapolation from sampling period, and predictions of risks to health

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Introduction

• Some tracks have surface material that was discarded waste product from an asbestos cement factory;
• The tracks are in a rural area, and the amount of asbestos material is variable from track to track;
• Several previous investigations;
• Further information was needed by the responsible public authorities;
• Several kilometres of tracks (public rights of way and farm tracks).
Institute of Occupational Medicine IOM

- Formed 1969 linked with British Coal
- Fully independent 1990
  - Governors Russel Griggs, Frank Davies ....
- Charitable status -not for profit
- Research, consultancy, training
- 130 staff
- Turnover approx £7M pa
IOM Mission

For the benefit of those at work and in the community

- to provide quality research, consultancy and training services in occupational and environmental health, hygiene and safety

- to maintain an independent centre of excellence applying scientific problem-solving methods in the workplace and in the wider environment
IOM and asbestos

• Fibre measurement:
  • full range of laboratory analyses;
  • development of methods (EC and HSE projects), asbestos in air (size selective sampling), asbestos in soils;
• Quantitative risk assessment, for risks arising from asbestos exposure.
• Operation of international fibre counting proficiency testing schemes (e.g. with Italian laboratories participating in the AFRICA);

www.iom-world.org
IOM Study

- Commissioned by the Public Authorities
  - Cambridgeshire County Council and Cambridgeshire District Council
- IOM asked to determine the exposure to asbestos and consequent risk to health
- Six tracks investigated
  - Included the tracks identified previously as being highest priority (most asbestos, nearby residents, and used by vehicles)
Sampling strategy

- Number of samplers per track ranged from 2 to 10 (according to track length, number of houses etc);
- Total of 25 samplers;
- Sampled over 4 periods of 7-days, i.e. one month of sampling;
- Flows checked every 24 hours and external batteries changed;
- Sample filters collected after 7 days of sampling.
Example of sampling site on tracks
Dust on the tracks
Air samplers on both sides of the tracks
Air Sample analysis

- Samples analysed by scanning electron microscopy (SEM) for asbestos fibres
- Airborne asbestos Concentrations calculated from each sample
- Overall average for each track (from 2 to 10 samplers) gave average for each week
- Concentrations, weekly averages, for 4 weeks in September 2004
- Only four tracks had measurable levels for all four weeks
Relative changes in concentration for each week at four tracks in September 2004

- Moor End Lane, Shepreth
- Shedbury Lane
- Newling Non-lets
- London Way
- Average
- Predicted
Simple model of weather dependence

Relative levels…

• negligible on wet days compared to dry days;
• lower on a dry day preceded by a wet day compared to a dry day preceded by a dry day;
• increase with sunshine drying the track surface, but by less than linear proportion to hours of sunshine;
• inversely dependent on the average wind speed, due to dilution.
• Formula is on page 15 of the report (http://www.iom-world.org/pubs/IOM_TM0507.pdf)
## Checking modelled concentration

<table>
<thead>
<tr>
<th>Track and study</th>
<th>Weather factor relative to Week 1 of Sept 2004</th>
<th>Asbestos fibre concentration fibres/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predicted</td>
<td>Measured</td>
</tr>
<tr>
<td>Moor End Lane, IOM Pilot Study (2 samples)</td>
<td>0.19</td>
<td>0.0013</td>
</tr>
<tr>
<td>London Way, June 2001 HSL’s measurements</td>
<td>1.44</td>
<td>0.00025</td>
</tr>
</tbody>
</table>
Extrapolation to annual average concentrations

<table>
<thead>
<tr>
<th>Track</th>
<th>Measured in Week 1</th>
<th>Predicted 2004 year</th>
<th>Predicted 2001 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moor End Lane</td>
<td>0.007</td>
<td>0.0019</td>
<td>0.0017</td>
</tr>
<tr>
<td>Shedbury Lane</td>
<td>0.0022</td>
<td>0.00061</td>
<td>0.00053</td>
</tr>
<tr>
<td>Newling Non-lets</td>
<td>0.0019</td>
<td>0.00053</td>
<td>0.00046</td>
</tr>
<tr>
<td>London Way</td>
<td>0.0017</td>
<td>0.00047</td>
<td>0.00041</td>
</tr>
<tr>
<td>Hill Top Farm</td>
<td>0.00069</td>
<td>0.00019</td>
<td>0.00017</td>
</tr>
<tr>
<td>Whaddon Estate (Fountain) Farm</td>
<td>0.00064</td>
<td>0.00018</td>
<td>0.00015</td>
</tr>
</tbody>
</table>
Summary of average concentration

- **Annual Average concentration estimates**
  - 0.0002 fibres/ml (on 2 of the 6 tracks)
  - 0.0005 fibres/ml (on 3 of the 6 tracks)
  - 0.002 fibres/ml, highest, (on 1 of the 6 tracks)

- **HEI - comparison**
  - 0.0001 f/ml outdoor urban
  - 0.00001 f/ml outdoor rural
  - 0.00002 f/ml in well-maintained building
Predicted risk to Health

- Epidemiological model of risk of mesothelioma, concentration, duration, and age
- Epidemiological model of risk of lung cancer due to asbestos exposure (cumulative exposure), risk multiplicative with risk from smoking
- “Worst case” scenario (equivalent to person being at the trackside for half of every day)
- “Realistic” exposure scenario (based on interview information from a few local residents)
- This presentation shows the mesothelioma risk predictions
Risks of mesothelioma for hypothetical exposure scenario

- For worst case, predicted risks of mesothelioma ranged from
  - 4 in 100,000 (lowest track) to
  - 40 in 100,000 (highest concentration track).
- For “realistic case” exposure scenario, highest predicted risks range from:
  - 0.4 in 100,000 (lowest track) to
  - 40 in 100,000 (highest concentration track).
- With resident population (houses on tracks) of about only 100 residents, deaths from this cause are unlikely.
Conclusions

- Risk predictions enabled public authorities to decide on appropriate actions, based on levels of risk that are regarded as “acceptable”.

- Modelling of the effect of the weather enabled extrapolation from one month of sampling to annual average concentrations – and the independent results from two other periods supported the extrapolation.

- Extrapolation might not work everywhere but the principles are widely applicable.
Thanks

- To Cambridgeshire County Council and South Cambridgeshire District Council for funding the study;
- To colleagues;
- To you for your attention.
Concentration in air vs concentration in dust on five sampling positions

![Graph showing the concentration of asbestos in air versus concentration in dust on five sampling positions.](image)